FOREST PRODUCTS
Project Fact Sheet

MILL DESIGNED BIOBLEACHING TECHNOLOGIES

BENEFITS

- Selectively removes lignin from pulp
- Improves pulp yields
- Reduces capital and operating expenses of delignification
- Minimizes chloride generation during bleaching
- Reduces use of fresh water
- Addresses current and future environmental regulations
- Exhibits true catalytic properties

APPLICATIONS

The LMS technology will be incorporated into U.S. pulp mills in the next 5 to 25 years. Fifty percent of the 106 mills that bleach pulp will need additional bleaching capacity, and LMS is a viable candidate.

New Bleaching Technology Will Address a Key Need of the Pulp and Paper Industry

Improvements in pulping and bleaching technologies have been identified as critical research priorities of the pulp and paper industry. Residual lignin in pulp causes discoloration and requires an aggressive bleaching process. Studies have shown that a laccase-mediator system (LMS) can potentially remove 55 percent of the residual lignin from a kraft pulp. A team of researchers will design and test new mediators for a laccase biobleaching system as an effective alternative to traditional pulp bleaching methods.

LMS systems will have a lower impact on the environment than oxygen delignification by eliminating the formation of chloride and absorbable organically bound chlorides (AOX). They will also aid in compliance with environmental regulations and a closed loop water program. Their other expected benefits are a lower capital investment, reduced operating costs in mills, and a safe system for selectively removing lignin and improving pulp yields.

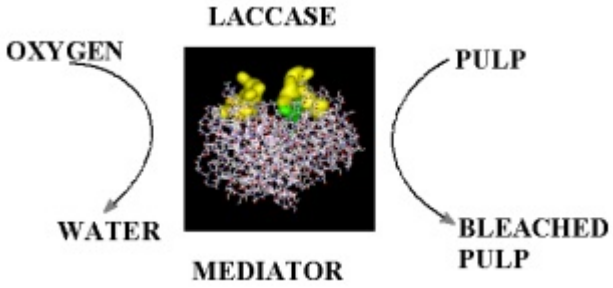

Figure 1. A laccase-mediator system uses the biobleaching enzyme, laccase, to produce bleached pulp.

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ENERGY EFFICIENCY AND RENEWABLE ENERGY • U.S. DEPARTMENT OF ENERGY

PROJECT DESCRIPTION

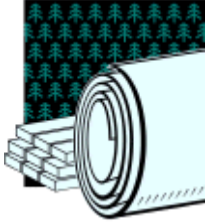
Goal: To delignify kraft pulps, producing a high yield of bleached pulps cost-effectively and with few environmental effluents.

Organic and inorganic laccase mediators will be designed and good candidates for this new technology will be identified through computer modeling methods developed at Auburn University. Optimal bleaching conditions will be determined under mill closure conditions (closed loop water use), and promising candidates subjected to laccase-mediator bleaching and then evaluated for various parameters (e.g., lignin content, brightness, viscosity, carbohydrate composition). The structure of the fiber surface will be optimized to enhance fiber-fiber bonding and pulp bleachability. A series of large-scale laccase-mediator-screening and full-scale-bleaching treatments will be performed to confirm the feasibility of using the technology in mills. Finally, the results of all these studies will be compared to the results achieved with more conventional bleaching sequences. The proposed technology will be assessed economically in preparation for commercialization.

PROGRESS & MILESTONES

Project milestones include the following:

- Development of new laccase mediators for delignifying both conventional and high kappa kraft pulps.
- Studies of inorganic mediators as alternatives to organic mediators.
- Use of mixtures of mediators to gain the additive effect of more than one mediator.
- Improvement in the physical properties of pulps bleached with new laccase-mediator systems.
- Use of the laccase-mediator system to alter the surface of the pulp to improve the pulp's physical properties.



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